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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/881,122 | 06/15/2001 | Eberhard Pantow | 016906-0220 | 7929 |

7590 08/23/2002

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EXAMINER

DUONG, THO V

ART UNIT

PAPER NUMBER

3743

DATE MAILED: 08/23/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/881,122

Applicant(s)

PANTOW ET AL.

Examiner

Tho v Duong

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 June 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-5,7,8,10-12 and 14-21 is/are pending in the application.
- 4a) Of the above claim(s) 17 and 21 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-5,7,8,10-12,14-16 and 18-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☒ The proposed drawing correction filed on 29 May 2002 is: a) ☒ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-5, 7, 8, 12, 14-16 and 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Beck et al. (US 6,070,616) in view of Rhodes (US 4,470,452) and Damsohn et al. (US 6,321,835). Beck discloses (figures 1, 2 and column 20-22) a heat exchanger comprising a plurality of flat tubes (10); elongated vortex generators (13, 14) in the form of indentation pointing inward of at least one flat face of the flat tube wherein the vortex generators (13, 14) which are adjacent transversely with respect to the tube longitudinal axis, are inclined in opposite directions. Beck further discloses (column 2, lines 45-50) that the vortex generator rows formed on the first flat surface (11) and the second flat surface (12) arranged in alternating relationship with respect to one another in the direction of the tube longitudinal axis. Beck further discloses (column 2, lines 34-38) that a ratio between a height of the vortex generator and a height of the flat tube is a fourth (0.25, 25%) to a third (0.33, 33%). Basing on geometrical relationship shown in figure 2, Beck discloses that the inclined angle of the vortex generators (13, 14) is within 10 degrees to 40 degrees with respect to the tube longitudinal axis. Beck does not disclose limitations including corrugated fins; at least three vortex generators; the ratio of distance between vortex generator rows to the length of the vortex generator; the ratio of transverse distance between the vortex generators to the length of the vortex generator; and the

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ratio of the distance between the first flat face and the second flat face of the vortex generator rows to the height of the vortex generator. Rhodes discloses (figures 1, 7C and column 3, lines 54-61) that a heat exchanger comprising a plurality of flat tubes having rows of at least three vortex generators (152) run transversely with respect to the tube longitudinal axis in a straight line and corrugated fins (16) in contact with the tubes to increase heat transfer from a coolant flowing through the tubes per unit volume of the heat exchanger. It would have been obvious to one having ordinary skill in the art at the time the invention was made to use Rhodes's teaching in Beck's device to increase heat transfer from a coolant flowing through the tubes per unit volume of the heat exchanger. Basing on geometrical relationship shown in figure 6, Rhodes discloses that a ratio between the vortex generator rows of the first flat surface (120) and the second flat surface (126) to the height of the vortex generator is about 7. It would have been obvious matter of design choice to select the ratio in range of 10 to 30 in view of Rhodes, since applicant has not disclosed that the ratio in range of 10-30 solves any stated problem or produces any new and/or unexpected result and it appears that the invention would perform equally well with the ratio of 7. Damsohn discloses (figures 5 and 7) a heat exchanger that has a plurality of flat tubes (19) having a plurality of rows of vortex generators (23,24) formed thereon. Basing on the geometrical relationship of figure 7, Damsohn discloses that the ratio of distance between rows of vortex generator to the length of the vortex generator is about 5 and the ratio of transverse distance between the vortex generators to the length of the vortex generator is within 0.1 to 0.9 to improve the heat transfer rate of the tube. It would have been obvious to one having ordinary skill in the art at the time the invention was made to use Damsohn's teaching in the combination device of Beck and Rhodes to improve heat transfer rate of the tubes.

Claims 10 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Beck, Rhodes and Damsohn as applied to claims 1,8 and 16 above, and further in view of Imai Shuji (JP 359125395A). Beck, Rhodes and Damsohn substantially disclose all of applicant's claimed invention as discussed above except for the limitation that the vortex generator rows are arranged at an angle β of 10 to 30 degrees. Imai discloses (figures 12 and 18) a heat exchanger that has a flat tube (5) having a plurality of vortex generator rows (2) formed on two flat faces of the tube. Basing on geometrical relationship shown in figures 12 and 18, the vortex generator rows are arranged at an angle β within the range of 10 to 30 degrees with respect to a line transverse to the tube longitudinal axis to create a tortuous path of a coolant flowing between the vortex generator in order to increase heat-exchanging efficiency of the heat exchanger. It would have been obvious to one having ordinary skill in the art at the time the invention was made to use Imai's teaching in the combination device of Beck, Rhodes and Damsohn to increase heat-exchanging efficiency of the heat exchanger.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

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however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

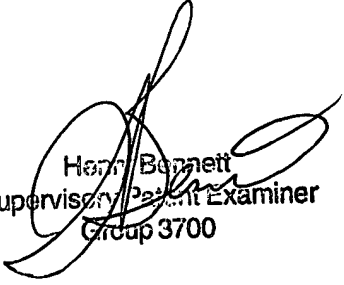
Any inquiry concerning this communication or earlier communication from the examiner should be directed to Tho Duong whose telephone number is (703) 305-0768. The examiner can normally be reached on from 9:30-6 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Henry Bennet, can be reached on (703) 308-0101. The fax phone number for the organization where this application or proceeding is assigned is (703)308-7764.

Any inquiry of a general nature or relating to status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0861.

Tho Duong

August 22, 2002


Henry Bennett
Supervisory Patent Examiner
Group 3700